CHAPTER 8
CAPITAL IMPROVEMENT PROGRAM

8.1 INTRODUCTION

Background

A wastewater system Capital Improvement Program (CIP) was developed based on the findings of the collection system capacity evaluation, pump station assessment, and pipeline rehabilitation and replacement analysis. The recommended CIP includes pipeline capacity improvements, pump station operational and capacity improvements, the implementation of a new Video Inspection Program, and several miscellaneous programs. Additionally, the CIP includes annual budgetary allowances for pipeline rehabilitation and replacement improvements. The CIP is presented in three phases – Phase 1: fiscal years 2004 – 2008, Phase 2: fiscal years 2009 – 2013, and Phase 3: fiscal years 2014-2023.

Objectives

The objectives of the Capital Improvement Program include:

- Identify annual budgetary estimates to construct facility improvements required to mitigate existing and projected capacity constraints

- Identify annual budgetary estimates to construct improvements to existing pump stations to address facility condition, operational, capacity, and/or regulatory deficiencies

- Develop annual budgetary estimates for pipeline rehabilitation and replacement improvements

- Recommend a phased implementation schedule for facility improvements

8.2 BASIS OF COSTS

Pipeline replacement costs are based on several sources including information from local contractors, suppliers and manufacturers and bid information on sewer improvement projects for other local agencies. Design and construction management services are included in the total unit cost, estimated at 15 percent and 10 percent, respectively. Project administration costs are not included because it is assumed that City staff will manage the project. The summary of unit pipeline replacement costs is included in Table 8-1. Note that these costs represent average planning-level estimates and it should be noted that unusual construction conditions, such as complex traffic control requirements, would likely result in higher construction costs.

Cost estimates for recommended video inspection programs and sewer rehabilitation improvements (such as lining and de-rooting) are based on actual costs of similar projects recently completed in San Diego County.

Table 8-1
Pipeline Replacement Unit Construction Costs

	Pipe Diameter (in)							
	8	10	12	15	18	21	24	27
Material Cost ($/lf)	2.09	3.27	4.68	6.69	10.44	14.55	19.08	24.50
Installation ($/lf)	2.45	3.68	4.90	5.51	7.96	11.64	15.31	21.44
Paving ($/lf)	14.95	14.95	14.95	14.95	14.95	14.95	14.95	14.95
Shoring ($/lf)	21.44	21.44	21.44	21.44	21.4	21.44	21.44	21.44
Excavation ($/lf)	23.30	23.84	24.39	23.25	26.14	27.06	28.02	29.01
Backfill ($/lf)	32.50	33.26	34.03	35.22	36.46	37.74	39.08	40.45
Subtotal	*96.72*	*100.42*	*104.38*	*109.32*	*117.38*	*127.37*	*137.87*	*151.78*
Engineering (15%)	15	15	16	16	18	19	21	23
Constr. Mgmt. (10%)	10	10	10	11	12	13	14	15
Mobilization (7%)	7	7	7	8	8	9	10	11
Overhead/Profit (15%)	15	15	16	16	18	19	21	23
Total ($/lf)	**142.18**	**147.62**	**153.44**	**160.70**	**172.55**	**187.24**	**202.67**	**223.11**

8.3   SEWER REHABILITATION AND REPLACEMENT

The City performs a proactive maintenance program where each pipe segment is cleaned every one and a half to two years. This clears any long-term buildup or debris from the collection system and helps prevent blockages or overflows. The City currently video inspects sewer reaches with known operational or structural problems, however, without a routine video inspection program, there may be undetected structural conditions (cracks, breaks, offset joints) in the pipes that may be areas of future concern. To address these deficiencies, an infrastructure rehabilitation and replacement program based on a routine video program is recommended.

Methodology

There are several alternatives to prioritizing sewer infrastructure projects for a capital improvement program, including:

(1) Using video data of a majority of the collection system to identify and prioritize specific project locations, scope and costs,

(2) Using limited video data, within the range of 10-50% of the system, to extrapolate costs for improvements for the portion of the system that was not video inspected, and

(3) Using the age of the system to estimate the magnitude of improvement projects that will likely be needed, assuming a typical useful life of pipe.

The City owns one truck outfitted with video equipment that is used typically to video problem areas that are in need of immediate repair. For this study, the City provided excerpts from video inspections of a few "hot spot" problem areas, however, without knowing the exact locations or dates of inspection these could not be used to identify specific projects or extrapolate to the remaining system. Therefore, this study and the recommended CIP are based on an age of pipe analysis.

Approach

The goal of the age of pipe analysis is to provide a basis for allocating the necessary funds to repair or replace pipe segments that are in the worst condition and pose the highest risks of sewer spills. Without a detailed condition assessment of the collection system, this approach assumes that the oldest pipes are those in the most need of improvement. For this study, the useful life of pipe is assumed to be 80 years. Though it is possible that there are segments over 80 years old in good working condition, this assumption provides a basis for cost estimating and allocating funds.

The age analysis is based on two sets of data provided by the City, the sewer system database and the June 2003 GASB34 analysis of the system. The sewer system database contains the diameter and length of pipe, while the GASB34 data provides the year of construction, diameter and length of pipe. Review of the data sets indicated that the system database includes a more comprehensive inventory of sewer pipes and, therefore, was used as the basis for the length of pipe used in the analysis. Based on the GASB34 analysis, the percentage of the total length of pipe in the system constructed in each decade was applied to the total length of pipe by diameter from the sewer system database. Based on discussions with staff, segments noted with year 1911 in the GASB34 report are assumed to have been constructed prior to 1940, note though that "1911" may indicate that the segments were constructed through Municipal Act of 1911 bond funding. The City may want to further research construction dates for these sewer reaches to confirm or update study assumptions. Table 8-2 and Figure 8-1 show the age of pipe data used in this analysis.

Rehabilitation and Replacement Budget

Based on the age of pipe analysis and an assumed useful life of 80 years, the 20-year CIP includes estimated costs for replacement and rehabilitation of all pipes listed as constructed prior to 1940. Based on discussions with City staff, the CIP assumes replacement of 20% of these older pipes and rehabilitation of 80% of the pipes within the next 20 years.

This portion of the CIP also includes costs to rehabilitate approximately 50 manholes per year and to apply herbicide to control areas with rooting problems (assumed 1.5 miles per year).

Table 8-2
Chula Vista Sewer System Date of Construction

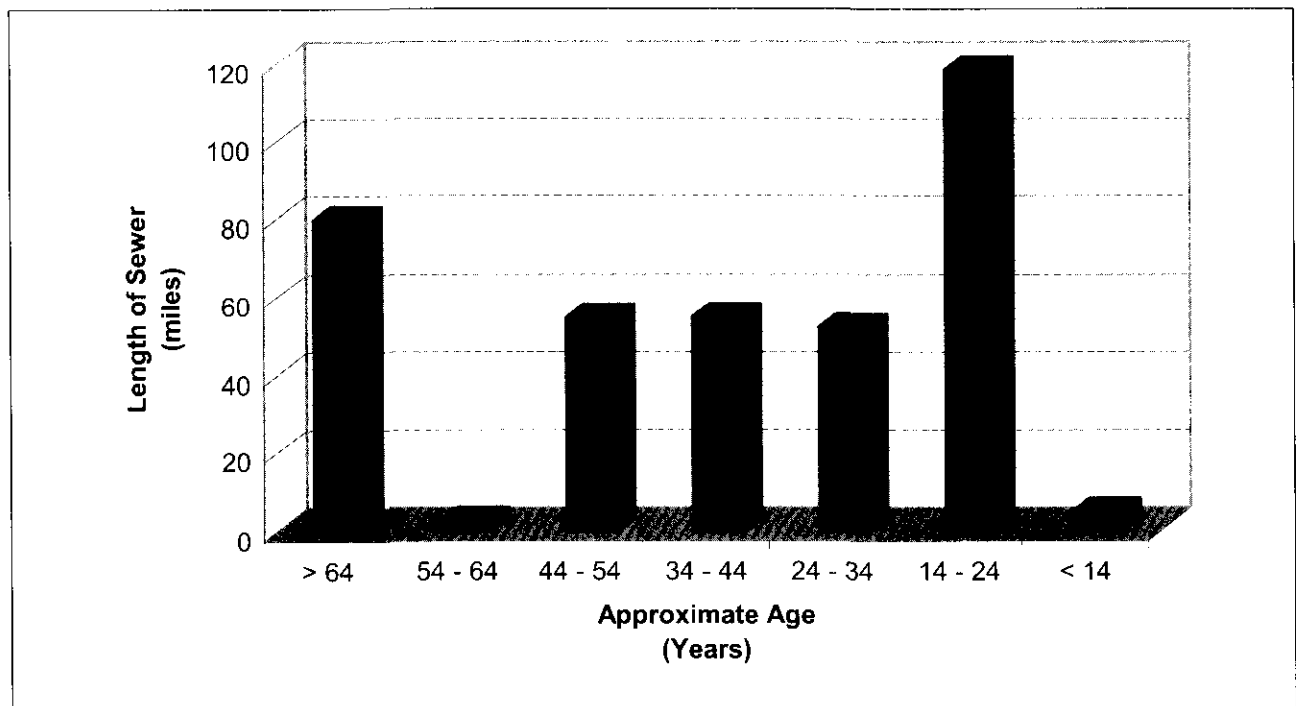| Decade Constructed	Pipe Length (feet)	Percent of Existing System
Pre - 1940	421,004	22%
1941 – 1950	14,177	1%
1951 – 1960	287,881	15%
1961 – 1970	289,143	15%
1971 – 1980	274,852	14%
1981 – 1990	626,215	32%
1991 – 2000	25,617	1%
Total	1,938,889	100%

Figure 8-1. Age of Sewer

Until more information is known about the pipeline conditions, the recommended CIP is based on an allocation of 33% of the estimated infrastructure project costs to the first 10 years and 66% to the last 10 years. After data is collected from the first 3 years of the video program, the CIP and user rates should be re-evaluated to include specific areas in most need of rehabilitation or replacement. A two-year phase in period for the rehabilitation and replacement program is assumed.

As shown in the CIP presented in Exhibit 5, the estimated 20-year cost for the replacement and rehabilitation program is approximately $41 million. Annual budgets included in the CIP for the initial 10-year period are $300,000 in year 1, $500,000 in year 2, and approximately $800,000 for the remaining years in Phase 1 and Phase 2. For reference, the City has historically allocated approximately $300,000 per year for sewer rehabilitation and replacement projects.

8.4   PUMP STATION IMPROVEMENT PROJECTS

Methodology

PBS&J conducted site inspections of seven sewer pump stations. The stations included the Police Station Department Sewer Pump Station (SPS), G Street SPS, Hilltop Drive SPS, Woodcrest Terranova SPS, Max Field Reinstra Sport Center Complex SPS (Max Field SPS), and Robinhood Ranch Unit II and III SPS.

The purpose of the site visits was for PBS&J to become familiar with the facilities, assess their overall condition, and check for any readily identifiable operational problems. The visits also provided a forum to discuss and record the City's concerns and requests for upgrades at each facility.

Subsequently, each pump station was evaluated in general, based on accepted sewer pump station design standards, and in particular, on the City Pump Station Design Standards (Subdivision Manual, Section 3: General Design Criteria). Each pumping station was assessed in terms of pumping capacity, system redundancy, operational reliability, safety and ease of operation, and environmental issues and community interests.

Pump Station Improvement Budget

A phased budget was developed based on priorities established with City staff input. The recommended improvements are included in Phases 1 and 2 of the CIP. Note that, based on the age of the existing pump stations, the City has historically not included major, programmed pump station improvements in the CIP, but rather has budgeted for annual routine maintenance costs.

Phase 1 (years 1 through 5) of the CIP comprises improvements to the Police Station Department SPS and G Street SPS. The capital cost of the Phase 1 improvements totals $2,450,000.

Phase 2 (years 6 through 10) comprises upgrades to the Hill Top Drive SPS, Woodcrest Terranova SPS, Max Field SPS and Robinhood Units II and III SPS. The total capital cost for Phase 2 amounts to $1,170,000.

Table 8-3 presents the improvement budget or each pump station.

Table 8-3
Pump Station Improvements CIP Budget Estimates

Pump Station	Improvement Budget
CIP Phase 1	
Police Station	$350,000
G Street	$2,100,000
Phase 1 Subtotal	*$2,450,000*
CIP Phase 2	
Hill Top Drive	$320,000
Woodcrest Terranova	$190,000
Max Field	$80,000
Robinhood Ranch Unit II	$270,000
Robinhood Ranch Unit III	$310,000
Phase 2 Subtotal	*$1,170,000*
Total	$3,620,000

8.5 SEWER CAPACITY EXPANSION PROJECTS

Methodology

Detailed hydraulic models of the City's wastewater collection system were developed and used to simulate existing and buildout wet weather flow conditions in mains generally larger than 12-inch in diameter. The models were calibrated to meter data recorded over the Memorial Day holiday period in 2003 at both permanent meters maintained by the City of San Diego and at temporary meters placed in support of the Master Plan. City buildout assumed 100 percent development of existing vacant parcels in accordance with current zoning and land use designations.

The simulations indicated that sewer reaches at four locations are overcapacity under existing, peak wet-weather conditions. No additional overcapacity reaches were identified under the buildout wet weather simulations. Locations of the projects are shown in Figure 4-22. Note that the City has proposed to alleviate the capacity constraints in the Main Street Trunk sewer by diverting flows generated upstream of the constrained reaches to the Salt Creek Interceptor. Consequently, based on City calculations, no reaches of the Main Street Trunk Sewer will

require improvement and the budgetary costs associated with this project consist of the construction cost of the proposed diversion facility.

In summary, based on the evaluation of the impacts resulting from the development of the City under the current adopted General Plan the City has a very limited extent of capacity-constrained sewers within the collection system, a testament to judicious facility planning as the older trunk sewers located in the western portions of the City appear to generally be of sufficient diameter to convey projected flows from the extensive planned development in eastern Chula Vista. Note that the impacts resulting from the buildout of the General plan would be further exacerbated by the adoption of any of the land use alternatives currently under consideration through the General Plan Update, which is being prepared concurrently with this Master Plan. These impacts are described in greater detail in Chapter 5. Newer mains located east of I-805, which typically have been installed through development fees, showed no capacity constraints through buildout of the City's General Plan.

Capacity Improvement Budget

Budgets for each of the projects are provided in Table 8-4. Since the projects are required to relieve capacity constraints under existing loading conditions, all of the projects were included in the Phase 1 CIP. The cost of each project was distributed evenly over the 5-year CIP phase.

Table 8-4
Sewer Main Improvements CIP Budget Estimates

Location	Approximate Replacement Length	Replacement Cost Estimate
Main Street Trunk Sewer Diversion (vicinity of Main and Fresno Streets)[1]	NA	$63,000
Colorado Street (Between K and J Streets)	1,314 ft	$283,000
Moss Street (Btwn Broadway and Woodlawn Avenue)	1,303 ft	$262,000
Center Street (Between 4th and Garrett Avenues)	630 ft	$127,000
Total	3,247 ft	$735,000

[1] Proposed diversion based on City conceptual studies and cost estimates

8.6   VIDEO INSPECTION PROGRAM

A sewer pipeline condition assessment provides utilities with valuable information that can be used to determine the funding requirements to repair and rehabilitate an aging collection system. These funds can then be used on priority locations that are in most need of attention. Cracks or breaks in pipes may cause structural failure and may allow exfiltration of wastewater or infiltration of groundwater. In addition, cracks or offset joints provide avenues for roots to find nourishment and can lead to excessive maintenance and possible blockages.

Closed circuit television cameras offer valuable insight to the structural condition of buried infrastructure. Video inspection of sewer pipelines is used to evaluate the existence and severity of cracks, misaligned joints, and potential sources of infiltration. The analysis of this data assists in determining where rehabilitation is required and which method of repair is most appropriate and cost-effective.

Due to the limited availability of video data, the proposed CIP includes a video inspection program that inspects 10% of the system each year, approximately 19,000 feet per year. The initial years of the video program should be targeted towards the "hot spots" and the older (pre-1940) sections of the system with the objective of evaluating a representative cross-section of the older reaches of sewer. After the first three years of the program, approximately 30% of the system will have been inspected and actual locations needing replacement or rehabilitation can be prioritized. Recognizing that a large percentage of the collection system is relatively new, later phases of the video program may be re-evaluated based on findings of initial inspections of newer reaches.

8.7   MASTER PLAN UPDATES

Costs to update the Sewer Master Plan are included every 5 years of the CIP based on the City's rapid growth and General Plan changes. The updates may be performed by City staff and are required to re-evaluate rehabilitation and replacement needs and to update wastewater flow projections based on revised City land use plans, including periodic amendments and updates to the General Plan, as well as revised METRO planning criteria.

8.8   CAPITAL IMPROVEMENT PROGRAM

The proposed sewer CIP is summarized in Exhibit 5.